



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
-----------------	-------------	----------------------	---------------------	------------------

10/625,490

07/22/2003

A. Farid Issaq

ACT-377

9116

28661

7590

04/01/2009

LEWIS AND ROCA LLP
1663 Hwy 395, Suite 201
Minden, NV 89423

EXAMINER

TRAN, THIEN F

ART UNIT

PAPER NUMBER

2895

MAIL DATE

DELIVERY MODE

04/01/2009

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/625,490	Applicant(s) ISSAQ ET AL.	
	Examiner Thien F. Tran	Art Unit 2895	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 30 December 2008.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 11, 12 and 14-19 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 11, 12 and 14-19 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>02/26/2009</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 11, 12, 14, 15 and 17-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hawley et al (US 6,437,365) in view of Jain et al (US 6,107,165) and Gangopadhyay (US 6,114,714).

Regarding claims 11, 12, 17 and 18, Hawley et al teach a metal-to-metal antifuse comprising (Fig 6): a tungsten plug (18) disposed in a via in an insulating layer (16) disposed above and in electrical contact with a lower metal interconnection layer (14); an antifuse layer (20) disposed above an upper surface of the tungsten plug, the antifuse layer comprising a lower SiN layer (22) considered as a lower adhesion-promoting layer, a middle layer (24) comprising amorphous silicon, and an upper SiN layer (26) considered as an upper adhesion-promoting layer; a layer of a barrier metal (30) disposed over the antifuse layer forming a second electrode, the layer of the barrier metal comprising a titanium nitride; and a second insulating layer of oxide layer (52) disposed over the insulating layer (16), the antifuse layer, and the layer of the barrier metal.

Hawley et al. do not teach that the layer of the barrier metal formed of tantalum nitride. Jain et al. teach titanium nitride and tantalum nitride can be used for barrier

Art Unit: 2895

metal (col. 4, line 66 - col. 5, line 3). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute the titanium nitride of Hawley with tantalum nitride as taught by Jain since titanium nitride and tantalum nitride are art recognized barrier metal material.

Hawley et al. in view of Jain do not teach the middle layer (24) comprising hydrogen doped amorphous carbon. Gangopadhyay teaches a hydrogen doped amorphous carbon used for antifuse material (2, Fig.1A). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute amorphous silicon with hydrogen doped amorphous carbon since amorphous carbon could reduce ON-OFF switching and leakage current.

Hawley, Jain and Gangopadhyay disclose the same structure as claimed but do not explicitly teach that the SiN layers (22 & 26) are adhesion-promoting layers. However, the adhesion-promoting layer of the present invention is formed of SiN or SiC (see page 3, Summary section in the specification, paragraph 0007); therefore, the SiN layers (22, 26) on both sides of the middle layer (24) of hydrogen doped amorphous carbon using the same material disclosed by the present invention inherently function as "adhesion-promoting layer" and would meet the recited term "a lower adhesion-promoting layer" and "an upper adhesion-promoting layer".

Regarding claim 14, Hawley et al. teach the antifuse layer having a thickness of 61 nm (col. 4, lines 29-32).

Regarding claim 15, Hawley et al. teach the layer of the barrier metal having a thickness of 200 nm (col. 4, lines 5-9 & col. 6, lines 26-30).

Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hawley, Jain, and Gangopadhyay, as applied to claim 11 above, and further in view of Han et al. (US 6,583,953).

Hawley et al. do not teach SiC used as an adhesion-promoting layer for the carbon. Han et al. teach in Fig.4, a SiC interlayer (60) forms as an adhesion layer for Carbon layer (66). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to select SiC instead of SiN as an adhesion layer that would have improved adhesive properties over conventional silicon-based adhesion layers like SiN (col. 4, lines 21-24).

Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hawley, Jain, and Gangopadhyay, as applied to claim 11 above, and further in view of Forouhi (US 5,181,096).

Hawley et al. do not teach a tungsten layer atop the barrier metal layer. Forouhi in Fig.1 teaches a tungsten layer (30) formed on the barrier metal (28). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teaching of Forouhi in Hawley in order to produce a device with a process compatible electrode.

Response to Arguments

The declaration under 37 CFR 1.132 filed 07/25/2008 is insufficient to overcome the rejection of claims 11, 12, 14-19 based upon references applied under 35 U.S.C. 103 as set forth in the last Office action for the following reasons:

Art Unit: 2895

In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., the antifuse does not switch and the antifuse using currents of 1mA) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993). It is noted that it is the claims that are rejected, not the present invention. It is the claims that define the claimed invention, and it is claims, not specifications that are anticipated or unpatentable. *Constant v. Advanced Micro-Devices Inc.*, 7 USPQ2d 1064. In other words, it does not matter that the prior art reference do not operate in the same manner as applicant's device where applicant's arguments are based on limitations not appearing in the claims. *In re Self*, 671 F.2d 1344, 213 USPQ 1 at 5 (CCPA 1982). Applicant cannot read limitations only set forth in the description into the claims for the purpose of avoiding the prior art. *In re Sporck*, 386 F.2d 924, 155 USPQ 687 (CCPA 1967). Also, it has been held that claims directed to apparatus must be distinguished from the prior art in terms of structure rather than function. *In re Danley*, 120 USPQ 528, 531 (CCPA 1959). "Apparatus claims cover what a device is, not what a device does." *Hewlett-Packard Co. v. Bausch & Lomb Inc.*, 15 USPQ2d 1525, 1528 (Fed. Cir. 1990). Also, claim 11 does not recite all materials for the device such as the specific material for the lower adhesion-promoting layer and the upper adhesion-promoting layer. As such, the device claimed in claim 11 is broad and does not possess the property or function disclosed in the specification.

In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). It is noted that the combined teachings of the prior art disclose the same device having all elements of the same materials as claimed. The combination of the teachings of the prior art result in the same device that read on the claims.

With respect to Jain et al reference, Applicant has argued about the operation of the device which is irrelevant to the materials used for barrier layers. The examiner does not use the device of Jain et al or the operation of the device but relies only on the teachings of the materials used for barrier layer in semiconductor device.

With respect to Gangopadhyay reference, Applicant has argued about the poor adhesion of the antifuse structure to substrate which is irrelevant to the materials used for the antifuse. The examiner does not rely on the adhesion layer or uses the device of Gangopadhyay. It is only the teaching of the material for the antifuse that the examiner relies on.

It is noted that claims do not recite the function or property. Even if claims recite the function or property for the sake of the arguments, it is elementary that the mere recitation of a new discovered function or property, inherently possessed by things in the prior art, does not cause a claim drawn to a device to distinguish over the prior art. The reference may suggest doing what an applicant has done even though workers in

Art Unit: 2895

the art were ignorant of the existence of the problem. In re Gershon, 152 USPQ 602 (CCPA 1967).

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thien F. Tran whose telephone number is (571) 272-1665. The examiner can normally be reached on 7:30AM - 4:00PM Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Drew N. Richards can be reached on (571) 272-1736. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 2895

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Thien F Tran
Primary Examiner
Art Unit 2895

/Thien F Tran/
Primary Examiner, Art Unit 2895